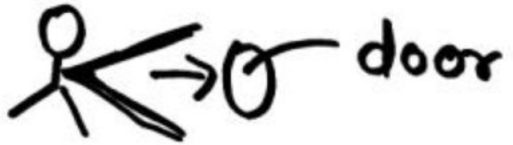
Vectors

Some Basic Concepts

Scalars ONLY Magnitude

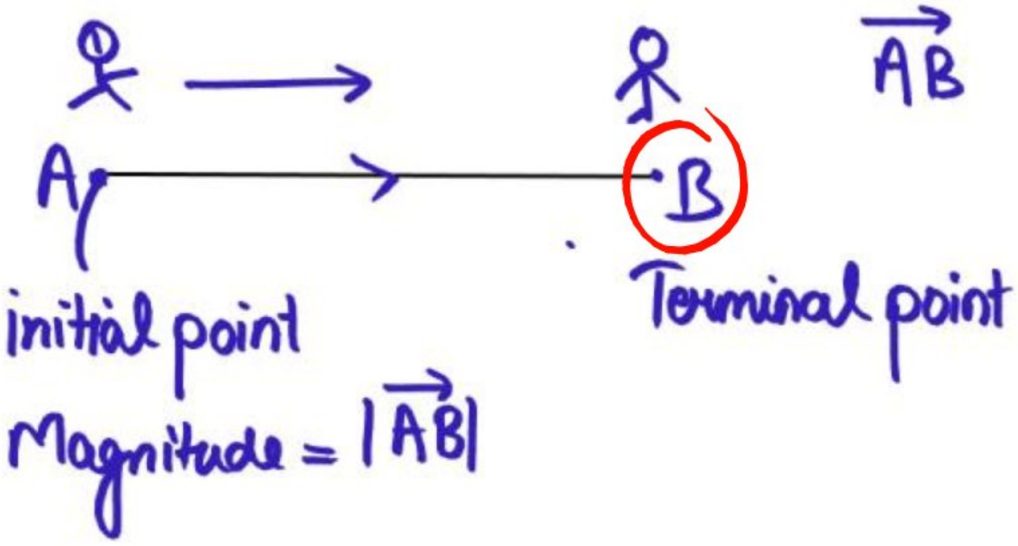
No direction.



Ex→ distance, Mass, temp, time

Vectors . Magnitude + Direction

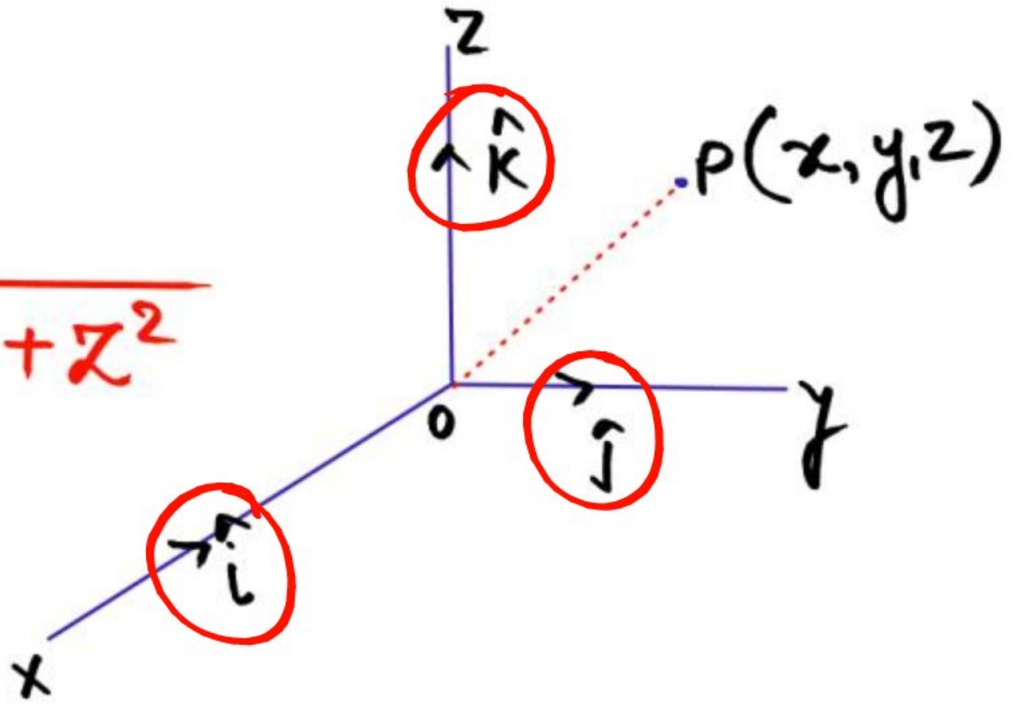
Ex→ displacement, force, weight



Position vector of a point

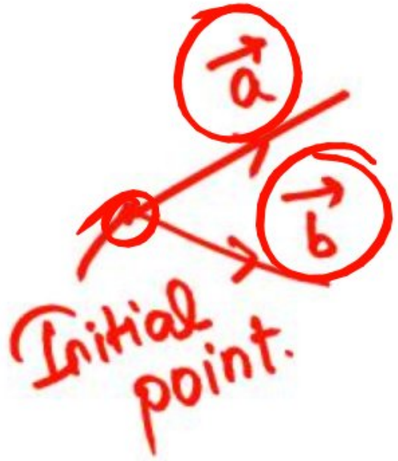
$$\overrightarrow{OP} = x\hat{i} + y\hat{j} + z\hat{k}$$

Magnitude of $\overrightarrow{OP} = |\overrightarrow{OP}| = \sqrt{x^2 + y^2 + z^2}$



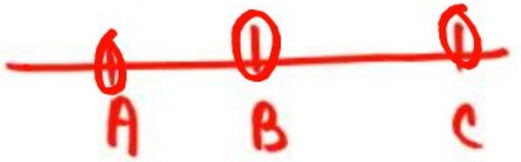
Types of Vectors

Coinitial Vector — Same initial point



Coplanar Vector — Same plane

Collinear Vector — Vectors ∥ to the Same line



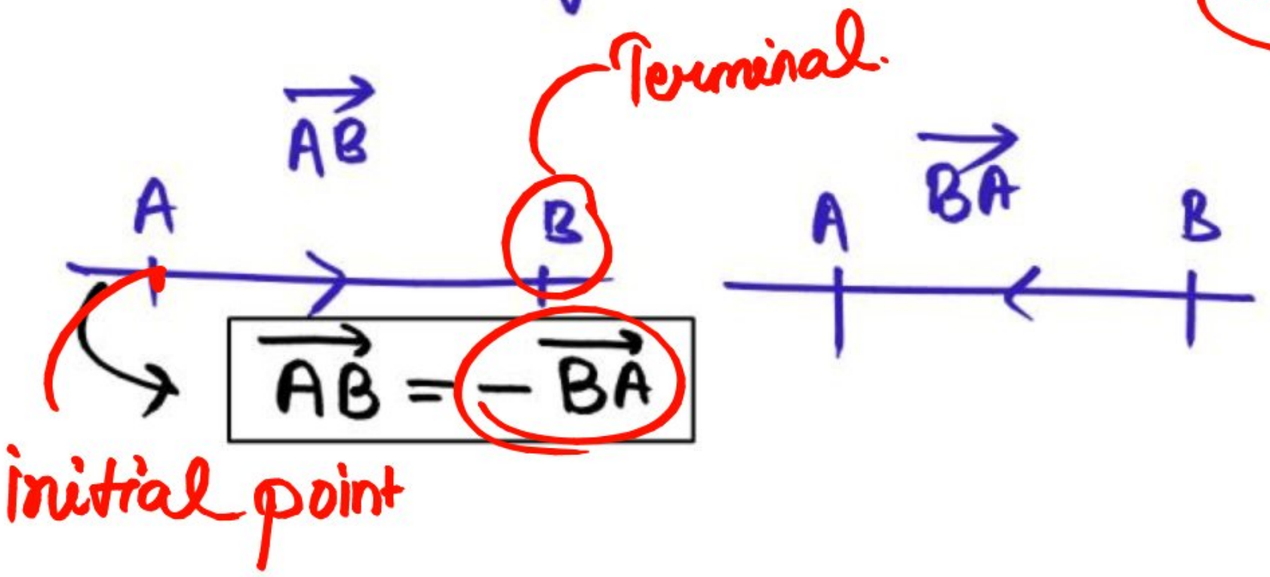
Free Vector — Vectors can be displace with out changed its Magnitude and direction

Null Vector

Null Vectors → Magnitude will be Zero

Mag = 0

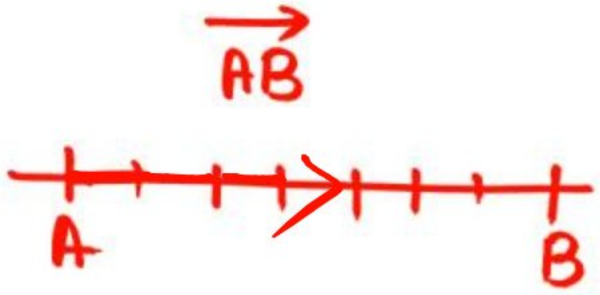
Negative Vector



Equal Vector

Equal Magnitude and Same direction

Unit vector ($\hat{a}$)



$$\hat{a} = \frac{\vec{a}}{|\vec{a}|}$$

$$\vec{a} = 2\hat{i} + 4\hat{j} + \hat{k}$$

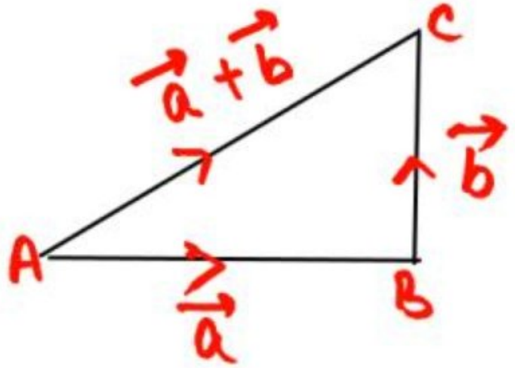
$$\hat{a} = \frac{\vec{a}}{|\vec{a}|}$$

$$\hat{a} = \frac{2\hat{i} + 4\hat{j} + \hat{k}}{\sqrt{4 + 16 + 1}}$$

$$\hat{a} = \frac{2\hat{i} + 4\hat{j} + \hat{k}}{\sqrt{21}}$$

Triangle Law.

$$\vec{AB} + \vec{BC} = \vec{AC}$$



gamma_career_classes_Founder.

U.P

$$\vec{a} = x_1\hat{i} + y_1\hat{j} + z_1\hat{k}$$

$$\vec{b} = x_2\hat{i} + y_2\hat{j} + z_2\hat{k}$$

$$\vec{a} + \vec{b} = (x_1 + x_2)\hat{i} + (y_1 + y_2)\hat{j} + (z_1 + z_2)\hat{k}$$

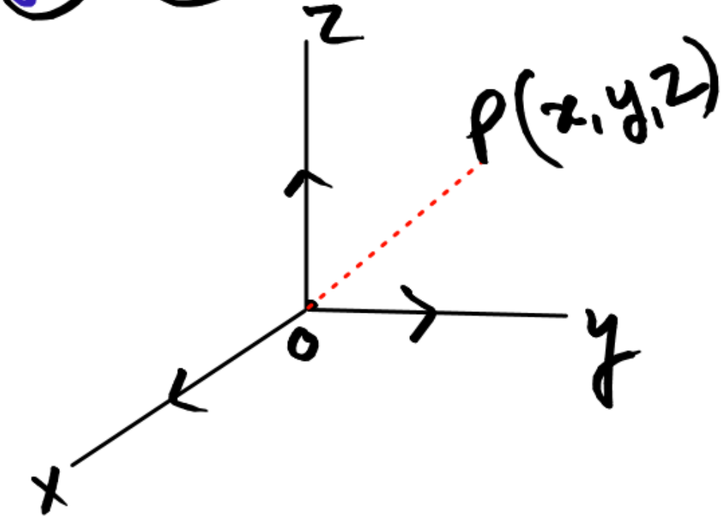
$$\vec{a} - \vec{b} = (x_1 - x_2)\hat{i} + (y_1 - y_2)\hat{j} + (z_1 - z_2)\hat{k}$$

Position:-

Component From of Position Vector

$$\vec{OP} = x\hat{i} + y\hat{j} + z\hat{k}$$

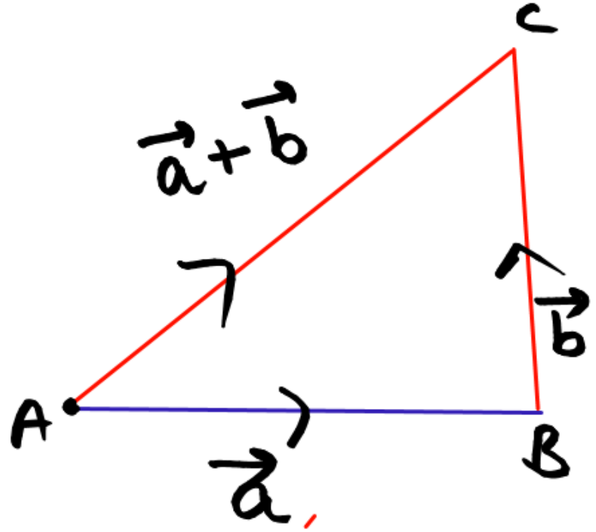
x, y, z are the Scalar Component of $\vec{OP}$ $x\hat{i}, y\hat{j}, z\hat{k}$ are Vector Component



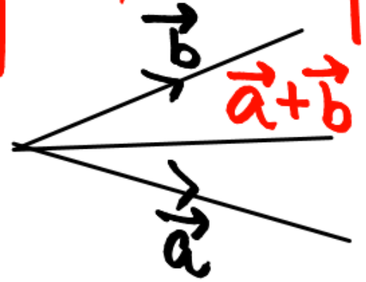
Triangle law of Add.

$$\vec{AB} + \vec{BC} = \vec{AC}$$

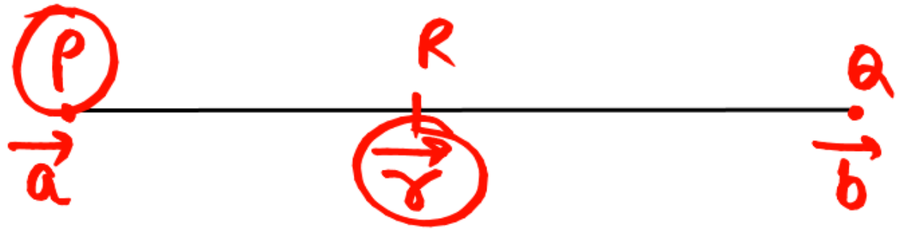
$$\boxed{\vec{AC} = \vec{AC}}$$



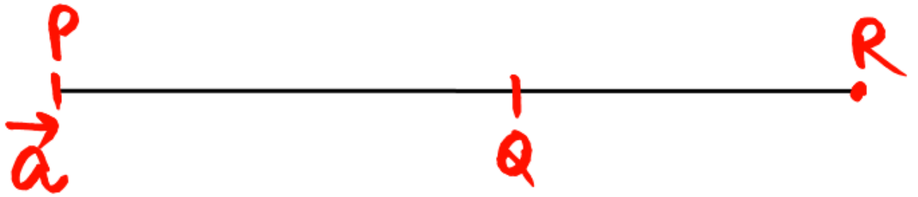
Parallelogram Law Addition



Section formula.



$$\vec{r} = \frac{m\vec{b} + n\vec{a}}{m+n}$$



$$\vec{r} = \frac{m\vec{b} - n\vec{a}}{m-n}$$

$$\frac{PR}{QR} = \frac{m}{n}$$

Direction Cosine of a vectors

Find the values of x and y so that the vectors $2\hat{\imath} + 3\hat{\jmath}$ and $x\hat{\imath} + y\hat{\jmath}$ are equal.

ii) If $\vec{a} = x\hat{\imath} + 2\hat{\jmath} - z\hat{k}$ and $\vec{b} = 3\hat{\imath} - y\hat{\jmath} + \hat{k}$ are two equal vector then write the value of $x + y + z$.

If $\vec{a} = x\hat{\imath} + 2\hat{\jmath} - 3\hat{k}$ and $\vec{b} = 3\hat{\imath} - y\hat{\jmath} + z\hat{k}$, then find the value of x , y and z so that $2\vec{a} = 3\vec{b}$

Find the magnitude of the following vectors:

i) $\hat{\imath} + \hat{\jmath} + \hat{k}$

ii) $2\hat{\imath} - 3\hat{\jmath} - 7\hat{k}$

Find the sum of the vectors $\vec{a} = \hat{\imath} - 2\hat{\jmath} + \hat{k}$, $\vec{b} = -2\hat{\imath} + 4\hat{\jmath} + 5\hat{k}$ and $\vec{c} = \hat{\imath} - 6\hat{\jmath} - 7\hat{k}$.

Find a unit vector in the direction of the vector $\vec{a} = 2\hat{\imath} - 3\hat{\jmath}$

Write a Unit vector in the direction of sum of vectors $\vec{a} = 2\hat{\imath} + 2\hat{\jmath} - 5\hat{k}$ and $2\hat{\imath} + j - 7\hat{k}$

If $\vec{a} = \hat{\imath} + \hat{\jmath} + 2\hat{k}$ and $\vec{b} = 2\hat{\imath} + \hat{\jmath} - 2\hat{k}$ find the unit vector in the direction of $2\vec{a} - \vec{b}$

Find a unit vector parallel to the sum of vectors $\vec{a} = 2\hat{\imath} + 4\hat{\jmath} - 5\hat{k}$ and $\vec{b} = \hat{\imath} + 2\hat{\jmath} + 3\hat{k}$.

i) Find a vector in the direction of the vectors $\vec{a} = \hat{\imath} - 2\hat{\jmath}$, whose magnitude is 7 units.

Write a vector of magnitude 9 units in the direction of the vector $-2\hat{\imath}+\hat{\jmath}+2\hat{k}$.

Find Vectors of magnitude 5 unit which are parallel to the sum of vectors $\vec{a} = 2\hat{\imath} + 3\hat{\jmath} - \hat{k}$ and $\vec{b} = \hat{\imath} - 2\hat{\jmath} + \hat{k}$.

Show that the vectors $2\hat{\imath} - 3\hat{\jmath} + 4\hat{k}$ and $-4\hat{\imath} + 6\hat{\jmath} - 8\hat{k}$ are collinear.

Write the value of p for which $\vec{a} = 3\hat{i} + 2\hat{j} + 9\hat{k}$ and $\vec{b} = \hat{i} + p\hat{j} + 3\hat{k}$ are parallel vectors.